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Abstract
Interference issues in the context of satellite communications can, in principle, be tackled with legal means from a variety of angles, due to the multifaceted character of both interference and satellite communications as a sector. From that perspective, the present contribution addresses the most important regulatory instruments available to address the particular aspects of satellite communications related to their usage of outer space, and represents a first summary effort to evaluate their particular scope, approach, and general effectiveness.

1. Introduction

The 3rd Luxembourg Workshop on Space and Satellite Communications Law, held at the University of Luxembourg on 5 and 6 June 2014, *inter alia* addressed the issue of harmful interference with telecommunication activities from a practical and operational perspective. In addition, several other speakers addressed specific regimes from this context, notably the ITU regime,[1] EU law,[2] and contract law.[3]

This leaves, at least for *satellite* communications, the "space side" to harmful interference to be discussed, which is what the present contribution will address. In doing so, it will focus on three main legal instruments: the Outer Space Treaty,[4] the Liability Convention,[5]

and national space law as a body of law *inter alia* implementing and elaborating some provisions of those two international treaties while allowing access to existing well-weathered national court systems for the purposes of solving disputes concerning harmful interference with satellite communication activities and the follow-on issue of compensation for the actual harm resulting from such interference.

From the same perspective, it has to be noted that "(harmful) interference" may in principle take three forms: (1) electronic interference, such as most notably by radio waves, the type of interference the ITU regime is most concerned with;[6] (2) kinetic interference, that is basically interference by way of "physical" collisions;[7] and (3) a residual kind of interference broadly speaking with satellite communication activities, for example in political or policy terms, which is however not what the present contribution is primarily concerned with.

2. Outer Space Treaty

The Outer Space Treaty as of 1 January 2014 has 103 parties and 25 signatories.[8] More generally, of course, partly because all major spacefaring nations have ratified the treaty it has been heralded (though somewhat imprecisely so) as the "Magna Carta" for outer space, meaning it is considered to apply in principle to all states and all space activities.[9]

Under its own terms, it applies to all (national) "activities in outer space," including private activities such as commercial satellite operations, and establishes international responsibility for the state whose "national activities" are at issue to ensure conformity with the provisions of the Treaty itself as well as, by proxy, all of international space law which has developed on its basis.[10]

This clause is further backed up by the reference to general international law including specifically the Charter of the United Nations,[11] which also includes for example the law developed within the ITU framework, and even EU law to the extent that it is to be considered "international law."[12] In other words, to the extent general international law provides for obligations resting upon states to avoid or address harmful interference with the lawful telecommunication activities of other states, such obligations would also extend to outer space.

A further clause in the Outer Space Treaty of importance here is the one providing for liability for damage caused by space objects,[13] focusing on the second category of interference noted above, but as this clause has been elaborated in considerable detail by the Liability Convention, it will be duly addressed further below.

Finally, the Outer Space Treaty requires space activities to be conducted with due regard for the space activities of other states, and if a potential arises for "harmful interference" with such activities, respective obligations of consultation exist as regards the states involved.[14] The reference to "harmful interference" here should perhaps be read as being broad enough to encompass also the third category noted above, but in practical terms in any event includes the two more narrowly defined categories, inclusive of the electronic interference with which satellite communication operators would currently be most concerned.

Yet, while there is a generic legal interest emanating from the Outer Space Treaty to avoid harmful interference of either category, the Treaty as such remains too unspecific and abstract to serve as a helpful legal instrument to combat harmful interference. The most specific and explicit obligation referencing "harmful interference" merely entails the duty to consult in good faith, as per Article IX—strictly speaking not even encompassing a duty to preclude or suspend an activity harmfully interfering with other states' (or their private companies') satellite operations.

When it comes to evaluating such clauses from the perspective of combating harmful interference with satellite communication activities, it should further be noted that the Outer Space Treaty does not provide for any specific dispute settlement procedure either. It would probably be fair to say that the general assumption (alternatively hope) of the drafters of the Treaty had been that such principles as that of the peaceful exploration and use of outer space, international cooperation in space activities and a general abidance by international law would minimize occurrences of harmful interference.[15] In any event, as the Treaty addresses states only, primary recourse in case of disputes would consequently be to diplomatic negotiations.

The only fallback the Treaty offers in case legal disputes nevertheless arise (and cannot be solved by diplomatic means) is found in Article III, where the reference to applicability of general public international law, including the UN Charter, in outer space could also entail access to general international dispute settlement mechanisms, such as the International Court of Justice (ICJ)[16] or the PCA Optional Rules on Arbitration of Disputes Relating to Outer Space Activities.[17]

In the latter case, private satellite communication operators could directly appraise themselves of the dispute settlement mechanism. In the former context it must be borne in mind that states are considered responsible for "national activities in outer space" also of "their" private operators,[18] which means they should mirror-wise also be willing and able to take up their cause in the context of an international legal dispute on harmful interference before the ICJ, as appropriate. It may finally be noted here that in the context of the ICJ the possibility exists of establishing specialized Chambers, which might do (more) justice to the specifics required for handling a satellite communications-related dispute.[19]

3. Liability Convention

The Liability Convention as of 1 January 2014 has 91 states parties, 22 signatories, and 3 intergovernmental organizations having accepted the substantive rights and duties provided for by the Convention.[20] The Convention obviously focuses on damage caused by space objects, which are not really defined by the Convention itself[21] but are usually considered to include anything launched into space[22] and in any event would also include communication satellites.

Compensable damage under the Convention is defined as "loss of life, personal injury or other impairment of health; or loss of or damage to property of States or of persons, natural or juridical, or property of international intergovernmental organisations."[23]

Generally, this has been taken to mean to refer to *material*, "physical" damage directly caused by a space object such as a communication satellite through—as far as in-space

damage is concerned—collision with another space object such as a communication satellite (the second category of interference noted above); in other words, excluding both (commercial) loss (of revenue) following any kind of interference as well as any damage caused by electronic interference (the first category noted above).[24] This would, consequently, in the first instance seem to be of little help for the types of disputes and damage satellite operators might be most concerned with.

However, if damage is found to be compensable under the Liability Convention, compensation for such damage at the same time is to be provided "in accordance with international law and the principles of justice and equity, in order to provide such reparation in respect of the damage as will restore the person, natural or juridical, State or intergovernmental organisation(. . .) to the condition which would have existed if the damage had not occurred."[25] This clause therefore *would* seem to also include "indirect," "consecutive" damage—at least if "triggering damage" as per Articles I, II, and III of the Convention would also have arisen, which may under certain circumstances still cause the Convention to be a useful tool in solving even harmful electronic interference disputes and/or disputes on consequential commercial damage resulting therefrom in the satellite communication sector.

Ultimately, however, without either an authoritative interpretation at the international interstate level of what Article XII of the Convention in this context is supposed to precisely mean or the judgment of an appropriate international court or tribunal on the issue, it is too early to determine exactly the extent to which the Liability Convention might present a useful tool for solving legal disputes on electronic interference with communication satellite operations and harm possibly resulting therefrom.

Next, it has to be pointed out that the Liability Convention is still a state-oriented system, which also applies to the dispute settlement system that it provides. Here, the first stage consists of diplomatic negotiations,[26] after which—if no satisfying solution is found within a year—either state may instigate the second stage of establishing a Claims Commission to address the dispute.[27] One further problem, from a dispute settlement-perspective, is that the decision of the Claims Commission is nonbinding, unless both parties agree otherwise in advance.[28]

On the other hand, the Liability Convention expressly leaves open the option to pursue other venues for settling relevant disputes, notably through recourse to national dispute settlement systems which—in contrast to the Claims Commission itself—are (also) available for private parties to a dispute.[29] While *not* mentioned specifically, this raises the issue of whether access to the ICJ (respectively the PCA Optional Rules), as briefly discussed above, would also remain a possibility for claimants and victims of, for example, satellite interference.

4. National space law

The above also brings us to the third element of this contribution, the role national space law might play in the context of disputes on harmful interference with satellite communications, noting of course that in various national jurisdictions extended mechanisms are available for the settlement of legal disputes in general. The material provisions of the

Outer Space Treaty and Liability Convention potentially applicable to interference disputes which were discussed above become relevant also on this level to the extent both treaties call for national implementation especially *vis-a-vis* private operators.

Here, Article VI of the Outer Space Treaty specifically calls for "authorisation and continuing supervision" of "national activities in outer space" carried out by "non-governmental entities."[30] Likewise, Article VII of the Outer Space Treaty and more or less all of the Liability Convention effectively urge relevant "launching State[s]" to exercise jurisdiction *vis-a-vis* relevant categories of private operators in outer space, since the former would be held liable for any damage caused by space objects even if operated by the latter.[31]

This, therefore, raises the question of how national space laws apply, implement and/or interpret the relevant clauses, and may possibly shed light on how such international clauses might be applied, implemented, and/or interpreted in particular in the context of possible disputes on harmful interference brought before the respective national courts. By way of case study the present contribution will focus on the interpretation of the key concept "damage caused by a space object" as fundamentally triggering the application of the Liability Convention, mainly in the context of national licensing of private space operators, and the extent to which both relevant categories of harmful interference would be included.

The 1982 Swedish Act on Space Activities requires reimbursement by a licensee of any claims which the Swedish government would have to compensate "on account of undertakings in international agreements," for "damage which has come about as a result of space activities."[32] The definition of "damage" thus, in the first instance, seems broader than just kinetic damage (with regard to the second category), although the reference to "undertakings by Sweden in international agreements" seems to refer the ultimate answer to the question of whether electronic interference (the first category) would be included back to the international level.

The 1986 UK Outer Space Act similarly requires indemnification by a licensee of the UK government for any legitimate claims for compensation addressed to the latter for all "damage or loss arising out of activities carried on" by the licensee, such activities encompassing "operating a space object" as well as "any [other] activity in outer space."[33] The United Kingdom therefore does not seem to define the compensable damage *ab initio* as being limited to kinetic damage and/or damage caused directly by a space object, although *international* claims to be handled as per the above would obviously (still) depend on the extent to which the Liability Convention would be seen as addressing only those, conversely including damage caused by electronic interference.

The 1993 Russian Law on Space Activities seems to be a bit more precise, and a bit more precisely limiting itself to the most common interpretation of the scope of the Liability Convention when it comes to compensable damage: here, the liability arrangements refer to "direct damage as a result of accidents," presumably also determining the scope of liability of individual legal entities or citizens.[34]

In the 1993 South African Space Affairs Act "damage" is not even expressly defined; both in the clauses on the licensing *per se* and in those dealing with liabilities of licensees a general deference to "the international obligations and responsibilities of the Republic" respectively "liability resulting from international conventions, treaties and agreements"

of South Africa effectively refer the question as to the scope of "damage" considered compensable under the Act back to the international level.[35]

Also the 1996 Ukrainian Law on Space Activity does not itself define "damage": "The responsibility for damage caused during space activity and order of definition of the size of such damage which is subject to compensation are established in accordance with the legislation in force of the Ukraine."[36] Further analysis would be required therefore before any further substantial conclusions as to the Ukrainian approach to damage caused (by harmful interference) to satellite communications and the possibility to claim compensation therefore in appropriate courts or tribunals would be possible.

The 1998 Australian Space Activities Act is rather straightforward in referring the issue of damage, and whether, for example, it includes nonkinetic damage, back to the international level, since "damage has the same meaning as in the Liability Convention."[37] Such a "definition," whatever it would turn out to be, does indeed apply to the context of licenses and permits potentially granted under the Act and the attendant obligations to reimburse the Australian government for international claims,[38] but it also suggests that in a national context this would be the primary type of harm for which compensation could successfully be sought.

The 2001 Brazilian Administrative Edict and attendant Regulation expressly copy the definition of "damage" from Article I(a) of the Liability Convention, as this concept is then applied to the launch licenses to be possibly granted under these pieces of national space legislation.[39] Essentially the same approach is followed by the 2005 Belgian Law on space activities.[40] For both jurisdictions therefore the same conclusions would apply as for Australia.

The 2005 South Korean space act takes an approach somewhat similar to that of the Russian Law, in that it refers to a proper accident having occurred: the license and liability arrangements pertain to "damage ensuing from a space accident caused by the space object."[41] As usually the term "accident" in such a context refers to a singular event of physical dimensions, that is a collision or other form of direct kinetic interference, this clause seems to support the narrower "standard" interpretation with regard to the Liability Convention.

Interestingly, the 2007 Dutch space law refers back more directly to Article VI of the Outer Space Treaty, rather than Article VII plus the Liability Convention, as it addresses "damage caused by [the] space activities" of a license holder, to which a redress obligation applies—instead of referencing "damage caused by a space object."[42] More uncertainty arises as Section 10(1) also refers to "damage" in a more general context and rather broadly defined, but this clause at least does not directly seem to impinge on the crucial redress obligations *vis-a-vis* the government.

The 2008 French Law on Space Operations takes a broad approach even more profoundly, in generally addressing "damage caused to third parties by space operations" as the categories of damage to which the indemnification claim of the government *vis-a-vis* the operator applies, and hence presumably envisaged as potentially giving rise to international liability of France in the first place.[43] Again, no specific reference to the key involvement of a space object as being the root cause of such damage is to be found in these provisions.

The 2011 Austrian Law on Space Activities, by contrast, again refers back more precisely to the international treaties' (lack of) definitions, by imposing upon licensees an indemnification obligation with respect to international claims addressed to Austria for "damage caused by a space activity *in accordance with international law*," although for the insurance obligation the phrase "damage caused to persons and property" is used instead.[44] This at least suggests that the former reference is actually being interpreted as essentially equating relevant forms of harmful interference to damage being caused to persons and property, at least as far as the Liability Convention would be concerned.

Finally, the 2012 Kazakh Law on Space Activities takes an even more vague and broad approach in referencing "[i]ndemnification for harm to the health of individuals, damage to the environment, property of individuals and legal entities, [and] the state" as being "voluntary or under the court decision according to the laws of the Republic of Kazakhstan."[45] Thus, the reference to the international treaties as the source of at least part of the potential liabilities is even more implicit here, but at this juncture would not necessarily exclude either kinetic or electronic interference from the scope of relevant disputes.

5. Conclusion

In conclusion, from this summary analysis of national space laws on the issue of "damage," to the extent it is considered to require national handling general confusion reigns as between damage caused by a (space) *object*, which more or less faithfully follows the Liability Convention in this sense (either by a specific reference to Article I(a) thereof or by a vague reference to applicable international agreements) and damage caused by a (space) *activity*, which would make a lot of sense compared to standard liability regimes. However, in the realm of space activities it ignores the specific approach taken by the Liability Convention. In the former case, likely compensable damage would remain confined to kinetic damage (the second category); in the latter case electronic interference and harm resulting therefrom (the first category) could likely be claimed as well.

In short, though—considering the general tendency to interpret the provisions regarding compensable damage under the Liability Convention in a limited fashion and the uncertainties surrounding interpretation and applicability of relevant clauses of the Outer Space Treaty—not likely also under "general" space law, both at the international but particularly at some national levels, opportunities may offer themselves to legally address "harmful interference" of either category. It would, however, certainly be of considerable benefit if the international community of states would be able to arrive at some common understanding of especially the Liability Convention's key relevant phrases in this context. As long as that does not occur, the proof of the pudding can only be in the eating, that is: when particular courts or tribunals are approached with conflicting legal claims as to the precise meaning of such terms and their consequences in terms of compensation being due or not being due, they will be forced to decide in one direction or the other.

Notes

1. The International Telecommunication Union (ITU) was established in its recent institutional form by the ITU Constitution (Constitution of the International Telecommunication Union, Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 1) and the ITU Convention (Convention of the International Telecommunication Union, Geneva, done 22 December 1992, entered into force 1 July 1994; 1825 UNTS 1; UKTS 1996 No. 24; Cm. 2539; ATS 1994 No. 28; Final Acts of the Additional Plenipotentiary Conference, Geneva, 1992 (1993), at 71), although both have already been amended repeatedly since. See further *supra*, F. Lyall, "Harmful Interference" and the ITU; M. Sakamoto, ITU and Harmful Interference Protection.
2. The operation of the European Union (EU), including all EU law, is currently based on the Treaty on European Union as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 326/13 (2012) and the Treaty establishing the European Community as amended by the Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, Lisbon, done 13 December 2007, entered into force 1 December 2009; OJ C 326/47 (2012). See further *infra*, G. Oberst, European Law as an Instrument for Avoiding Harmful Interference.
3. See further *infra*, J. F. Mayence, Harmful Interferences in Telecommunications under International and National Space Law.
4. Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (hereafter Outer Space Treaty), London/Moscow/Washington, done 27 January 1967, entered into force 10 October 1967; 610 UNTS 205; TIAS 6347; 18 UST 2410; UKTS 1968 No. 10; Cmnd. 3198; ATS 1967 No. 24; 6 ILM 386 (1967).
5. Convention on International Liability for Damage Caused by Space Objects (hereafter Liability Convention), London/Moscow/Washington, done 29 March 1972, entered into force 1 September 1972; 961 UNTS 187; TIAS 7762; 24 UST 2389; UKTS 1974 No. 16; Cmnd. 5068; ATS 1975 No. 5; 10 ILM 965 (1971).
6. Cf., e.g., Arts. 1(2), 45, ITU Constitution (*supra*, n. 1). See further in particular on the role of the ITU Radiocommunication Sector in this context, e.g., F. Lyall & P. B. Larsen, *Space Law—A Treatise* (2009), 224 ff.; F. Lyall, The Role of the International Telecommunication Union, in *Outlook on Space Law over the Next 30 Years* (Eds. G. Lafferranderie & D. Crowther) (l997), 257–58; C. Koenig & J. D. Braun, The International Regulatory Framework of EC Telecommunications Law: The Law of the WTO and the ITU as a Yardstick for EC Law, in *EC Competition and Telecommunications Law* (2002), 21–22.
7. This refers especially to interference in the sense of physical damage, and consequently leads directly to the issue of liability for such damage; this is of course also what, e.g., the Liability Convention (*supra*, n. 5) is concerned with; see further *infra*, § 3.
8. See http://www.unoosa.org/pdf/limited/c2/AC105_C2_2014_CRP07E.pdf, at 10; last visited 13 November 2014. Note that in accordance with Art. 18(a), Vienna Convention on the Law of Treaties (Vienna, done 23 May 1969, entered into force 27 January 1980; 1155 UNTS 331; UKTS 1980 No. 58; Cmnd. 4818; ATS 1974 No. 2; 8 ILM 679 (1969)), prior to ratification states are still under an obligation "not to defeat the object and purpose of a treaty" following signature.
9. Cf. in general, e.g., on the so-called "*traite-lois*" as opposed to "*traite-contrats*." J. Crawford, *Brownlie's Principles of Public International Law* (8th ed.; 2012), 31–32; H. Thirlway, The Sources of

International Law, in *International Law* (Ed. M. D. Evans) (2003), 122–23; M. Fitzmaurice, Treaties, in *Encyclopedia of Public International Law* (Ed. R. Wolfrum), Vol. IX (2012), 1062.

10. Art. VI, Outer Space Treaty (*supra*, n. 4). See further on this B. Cheng, *Studies in International Space Law* (1997), 618; M. Lachs, *The Law of Outer Space* (reprint 2010), 113–14; G. Gal, *Space Law* (1969), 129–39; S. Bhat & P. I. Bhat, Legal Framework of State Responsibility and Liability for Private Space Activities, in *Space Law in the Era of Commercialization* (Ed. S. Bhat) (2010), 139.
11. Charter of the United Nations (hereafter UN Charter), San Francisco, done 26 June 1945, entered into force 24 October 1945; USTS 993; 24 UST 2225; 59 Stat. 1031; 145 UKTS 805; UKTS 1946 No. 67; Cmd. 6666 & 6711; CTS 1945 No. 7; ATS 1945 No. 1.
12. See Art. III, Outer Space Treaty (*supra*, n. 4).
13. See Art. VII, Outer Space Treaty (*supra*, n. 4).
14. Art. IX, Outer Space Treaty (*supra*, n. 4).
15. Cf. Arts. I, III, Outer Space Treaty (*supra*, n. 4).
16. As established by the Statute of the International Court of Justice, San Francisco, done 26 June 1945, entered into force 24 October 1945; 156 UNTS 77; USTS 993; 59 Stat. 1031; UKTS 1946 No. 67; ATS 1945 No. 1. The Statute "forms an integral part of the [UN] Charter"; Art. 92, UN Charter (*supra*, n. 11).
17. See in detail further, e.g., F. G. von der Dunk, About the New PCA Rules and Their Application to Satellite Communication Disputes, in *Proceedings of the Second Luxembourg Workshop on Space Communication* (Ed. M. Hofmann) (2014), 93 ff.
18. Art. VI, Outer Space Treaty (*supra*, n. 4).
19. Cf. Art. 26, Statute of the International Court of Justice (*supra*, n. 16).
20. See http://www.unoosa.org/pdf/limited/c2/AC105_C2_2014_CRP07E.pdf, at 10; last visited 13 November 2014. In accordance with Art. XXII, Liability Convention (*supra*, n. 5), and in accordance with its terms it is possible for intergovernmental organizations to qualify as *de facto* parties to the Convention.
21. Cf., however, the partly vague, partly circular effort at Art. I(d), Liability Convention (*supra*, n. 5).
22. Cf. also, e.g., V. Kopal, The Question of Defining Outer Space, 8 *Journal of Space Law* (1980), 154ff.; also T. Neger & E. Walter, Space law—an independent branch of the legal system, in *Outer Space in Society, Politics and Law* (Eds. C. Brunner & A. Soucek) (2011), 237–41; B. Cheng, The Legal Regime of Airspace and Outer Space; The Boundary Problem, Functionalism versus Spatialism: The Major Premises, 5 *Annals of Air and Space Law* (1980), 323–61.
23. Art. I(a), Liability Convention (*supra*, n. 5).
24. Cf. also Art. II, III, Liability Convention (*supra*, n. 5); see further, e.g., L. J. Smith & A. Kerrest de Rozavel, The 1972 Convention on International Liability for Damage Caused by Space Objects, in *Cologne Commentary on Space Law* (Eds. S. Hobe, B. Schmidt-Tedd & K. U. Schrogl), Vol. II (2013), 111–13; C. Q. Christol, *The Modern International Law of Outer Space* (1984), 91–105; Cheng, *supra* n. 10, 323–24; C. Q. Christol, International Liability for Damage Caused by Space Objects, 74 *American Journal of International Law* (1980), 355–68.
25. Art. XII, Liability Convention (*supra*, n. 5).
26. See Art. IX, Liability Convention (*supra*, n. 5); cf. also Art. XIV.
27. See further Arts. XIV–XX, Liability Convention (*supra*, n. 5).
28. Cf. Art. XIX(2), Liability Convention (*supra*, n. 5).
29. See Art. XI(2), Liability Convention (*supra*, n. 5).

30. See further, e.g., S. Gorove, Liability in Space Law: An Overview, 8 *Annals of Air and Space Law* (1984), 377; A. Kerrest de Rozavel, Remarks on the responsibility and liability, in *Proceedings of the Fortieth Colloquium on the Law of Outer Space* (1998), 139; H. A. Wassenbergh, Public law aspects of private space activities and space transportation in the future, in *Proceedings of the Thirty-Eighth Colloquium on the Law of Outer Space* (1996), 246; Cheng, *supra* n. 10, 658–63; V. S. Vereshchetin, Space activities of "non-governmental entities": issues of international and domestic legislation, in *Proceedings of the Twenty-Sixth Colloquium on the Law of Outer Space* (1984), 263; Lachs, *supra* n. 10, 114; F. G. von der Dunk, *Private Enterprise and Public Interest in the European "Spacescape"* (1998), 18–19.
31. Art. I(c), Liability Convention (*supra*, n. 5). See further, e.g., I. Marboe & F. Hafner, Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties, in *National Space Legislation in Europe* (Ed. F. G. von der Dunk) (2011), 51–57; Von der Dunk, *supra* n. 30, 107–64.
32. Sec. 6, Act on Space Activities, 1982: 963, 18 November 1982; National Space Legislation of the World, Vol. I (2001), at 398; *Space Law—Basic Legal Documents*, E.II.1; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 11.
33. Secs. 10(1) resp. 1, Outer Space Act, 18 July 1986, 1986 Chapter 38; National Space Legislation of the World, Vol. I (2001), at 293; *Space Law—Basic Legal Documents*, E.I; 36 *Zeitschrift für Luft- und Weltraumrecht* (1987), 12.
34. Art. 30(1), see also § (2), Art. 25(1), Law of the Russian Federation on Space Activities, No. 5663-1, 20 August 1993, effective 6 October 1993; *National Space Legislation of the World*, Vol. I (2001), at 101. For the licensing framework, see Art. 9.
35. Secs. 11(2.c) resp. 14(1.b), Space Affairs Act, 6 September 1993, assented to on 23 June 1993, No. 84 of 1993; Statutes of the Republic of South Africa—Trade and Industry, Issue No. 27, 21–44; *National Space Legislation of the World*, Vol. I (2001), at 413.
36. Art. 25, Law of the Ukraine on Space Activities, No. 502/96-VR, 15 November 1996; *National Space Legislation of the World*, Vol. I (2001), at 36.
37. Sec. 8 sub 8, An act about space activities, and for related purposes (hereafter Australian Space Activities Act), No. 123 of 1998, assented to 21 December 1998; *National Space Legislation of the World*, Vol. I (2001), at 197.
38. Cf. Secs. 47, 48, 63, 64, 66 through 69, Australian Space Activities Act (*supra* n. 37).
39. See Arts. 2, 5, 9, Regulation on Procedures and on Definition of Necessary Requirements for the Request, Evaluation, Issuance, Follow-Up and Supervision of Licenses for Carrying Out Launching Space Activities on Brazilian Territory, Enclosure, Administrative Edict No. 27, 20 June 2001; *National Space Legislation of the World*, Vol. II (2002), at 377.
40. Cf. Art. 3(12), Law on the Activities of Launching, Flight Operations or Guidance of Space Objects, 17 September 2005, adopted 28 June 2005; *Nationales Weltraumrecht/National Space Law* (2008), at 183; see for the authorization clauses: Arts. 4 through 6.
41. Art. 14, cf. also Arts. 11, 15, Space Development Promotion Act, Law No. 7538, of 31 May 2005, entered into force 1 December 2005; unofficial translation 33 *Journal of Space Law* (2007), 175.
42. 42 Sec. 12(2), Law Incorporating Rules Concerning Space Activities and the Establishment of a Registry of Space Objects, 24 January 2007; 80 Staatsblad (2007), at 1; *Nationales Weltraumrecht/National Space Law* (2008), at 201.
43. Art. 13, also Art. 14, Law on Space Operations (*Loi relative aux operations spatialis*); *Loi no. 2008-518 du 3 juin 2008*; unofficial English version 34 Journal of Space Law (2008), 453.

44. Secs. 11(1) resp. 4(4), Austrian Federal Law on the Authorisation of Space Activities and the Establishment of a National Space Registry (*Bundesgesetz über die Genehmigung von Weltraumaktivitäten und die Einrichtung eines Weltraumregisters*), as adopted by Parliament on 6 December 2011; Federal Law Gazette of 27 December 2011; 61 *Zeitschrift für Luft- und Weltraumrecht* (2012), 37–42, 56–61; emphasis added.
45. Art. 27(2), Law of the Republic of Kazakhstan on Space Activities, of 6 January 2012, 2012 No. 528-IV; http://www.oosa.unvienna.org/pdf/spacelaw/national/kazakhstan/528-IV_2012-01-06E.pdf.

Bibliography

Cologne Commentary on Space Law (Eds. S. Hobe, B. Schmidt-Tedd & K. U. Schrogl), Vol. I, Outer Space Treaty (2009).

Lyall, F. & P. B. Larsen, Space Law—A Treatise (2009).

Marboe, I., & F. Hafuer, Brief Overview over National Authorization Mechanisms in Implementation of the UN International Space Treaties, in National Space Legislation in Europe (Ed. F. G. von der Dunk) (2011), 29–71.

Smith, L. J., A. Kerrest de Rozavel & F. Tronchetti, The 1972 Convention on International Liability for Damage Caused by Space Objects, in Cologne Commentary on Space Law (Eds. S. Hobe, B. Schmidt-Tedd & K. U. Schrogl), Vol. II (2013), 83–226.

von der Dunk, F. G., About the New PCA Rules and Their Application to Satellite Communication Disputes, in Proceedings of the Second Luxembourg Workshop on Space Communication (Ed. M. Hofmann) (2014), 93–125.

von der Dunk, Private Enterprise and Public Interest in the "European Spacescape" (1998).